

Design A Smart Safety Device For Women's Safety Using Raspberry Pi Pico & Implementation In Iot

Priyanka Mehta¹, Dr. Vikas Somani², Dr. Awanit Kumar³

¹Research Scholar, Department Of CSE, Sangam University, Bhilwara, Rajasthan, India,
priyankamehta2606@gmail.com

²Associate Professor, Department Of CSE, Sangam University, Bhilwara, Rajasthan, India,
vikas.Somani@sangamuniversity.ac.in,

³Assistant Professor, Department Of CSE, Sangam University, Bhilwara, Rajasthan, India,
awanit.Kumar@sangamuniversity.ac.in,

***Corresponding Authors: Priyanka Mehta**

*Research Scholar, Department Of CSE, Sangam University, Bhilwara, Rajasthan, India,
priyankamehta2606@gmail.com

Abstract

Women's safety has always been a concern, even in the present era with all the technological advancements. Women are unsafe, especially at risk when exploring isolated areas and lonely roads. Women's hand-held safety gadgets on the market require human interaction to activate the Device if it detects a threat, such as by pressing a button or shaking the Device. We offer a solution that aims to provide women with false safety and eliminate the current systems' drawbacks. The proposed effort intends to develop an IoT-based safety gadget that protects women by connecting to it via a Raspberry pi Pico, notifying individuals in the area, offender photos, SMS alerts, and calling on registered numbers and the authorities when a woman is in danger.

If the Device detects no signal after a minute Telegram-based photo Alert will be sent through ESP32-CAM; it will automatically send the pictures and warn with a buzzer sound and danger message, with a phone call. The suggested design includes extra functionality like a long device backup and picture recording. A wearable gadget is explicitly created for women's protection. It displays safe spots on a map concerning the victim's and offender's current position so that the woman may get there. Women today face numerous issues, such as harassment, in the contemporary global environment. Our proposed module device combines several gadgets; the hardware consists of a wearable "Smart band" that constantly communicates with a smartphone with or without internet access. This describes in full how the "Smart band" was created and put into use. The gadget consists of a trigger, a body touch sensor, a microcontroller, a GSM (SIM800) module, a GPS module, an IoT module, a Raspberry Pi Pico, a Buzzer, and ESP Camera.

Keywords: Women Safety Device, IoT, Raspberry Pi, Body Touch Sensor, SIM 800 L

1. Introduction

Women's safety has always been a concern, even in the present era with all the technological advancements. Women are never safe and are especially at risk when exploring isolated areas and lonely roads alone. Existing hand-held gadgets for women's protection need to be activated by a woman, such as by pressing a button or shaking the Device, etc., once the woman has detected a threat. However, the goal of the safety device is not served if a woman does not have enough time to activate it while in danger. Women's protection is essential in a country like India, where crime is thought to be increasing at a faster rate than the population. These crimes include rapes, murders, and other violent crimes.

Women's safety in the modern world is threatened, particularly in India. In particular, harassment, molestation, eve-teasing, rape, kidnapping, and domestic violence are crimes against women that are not declining but rising alarmingly. The government has implemented numerous preventative measures to stop this wrongdoing acts, but they have had no impact on the rising incidence of these crimes. The issue of sexual harassment at work is becoming more prevalent every day.

Other components in the recommended works that further support women include Using both the gadget and the registered phones to send group texts, Capturing the offender's image for use as evidence against them in the future, Using the map to find a secure spot based on the victim's current location

2. Related Work

The proposed design addresses most of the major problems women experience and is based on GPS and GSM. The victim's location may be seen using this mechanism's latitude and longitude, which can then be traced using Google Maps. This approach aids in lowering the rate of crimes against women. Real-time deployment of our suggested system will assist put an end to these atrocities. The PIC16877A microcontroller is employed. The push button, GPS module, GSM modem, and speech circuit are connected (ISD1820PY). Internet of Things is essential [2]. A crucial part in the system. Body temperature and skin resistance are measured variables with IoT. Force sensors and skin resistance accelerometers are the hardware components employed. People use the Device when they want to travel to a remote location and when they need protection. The main goal of this work is to develop a wearable IOT device for the safety and security of women, girls children, and information about rape and other violence against women occurring in society.

Due to increased crimes against women recently, women's safety [3] is a crucial topic. The devices currently use the human body's temperature and heartbeat to trigger an alarm in an emergency. Every person's body temperature and heartbeat pattern may differ; thus, using a fixed threshold to determine an emergency condition and then sounding an alert is not the right course of action. Because of this, existing devices frequently fail to sound an alarm in an emergency. It focuses on creating a wearable safety device for women that can run and automatically monitor and develop patterns like body temperature and pulse rate. It will automatically call and message multiple people if readings exceed the average. Sensors first gather the data in a safe environment to train the algorithm, and then that data is utilized to check the gauge accuracy. Thirdly, it addresses situations where there is no access to the internet.

Due to a lack of safety, women in nations like India are experiencing increased physical difficulties due to the use of wearable technology [4]. Although the government does offer some safety measures, each woman must take responsibility for her safety. In such a situation, additional protective gear is required. The safety gadget is a wearable jacket with a control button that, when pressed, sends position data via a GPS and GSM modem to the victim's parents and the nearest police station. In an emergency, the jacket can also deliver a non-lethal electric shock to the assailant to assault or repel them. Women Security System [5] lists studies on the security measures for women that enable quick action in the event of harassment. RFID technology is used in the security system. A button on the watch is pressed when the user is in danger or in a life-or-death situation. An RFID is integrated into the watch, and an RFID reader is integrated into the mobile phone. Mobile devices receive radio frequency transmissions from RFID tags. The processor analyses the data and uses GPS to send the alert "HELP" and the locations of 4 or 5 pre-defined contacts.

The Women Security System [6] is quite advantageous. A single-touch GSM and GPS technology that gives ladies a sense of security. The system comprises Raspberry Pi, GSM, GPS, and a force sensor. When a button on the Device is pressed and a woman is in danger or a dangerous environment, the GPS and GSM start tracking her location. The mechanism notifies the pre-specified phone number and the police control room. Children and women are completely secure thanks to the system. The Internet of Things-based Smart Security Solution for Women [7] is a tool that detects victims automatically and intervenes to save them. The hardware consists of an internet-connected wearable "Smart Band" that connects to a smartphone.

When an emergency signal is sent to a smartphone, an application configured with dates like anger, fear, and anxiety is generated as a signal and sent to the phone. The software generates a message (GPS location) and sends it to the local police station or pre-processed number. The Internet of Things [9] and wearable technology are used to study the factors influencing employee utilization of wearable technology at work. To create a conceptual model, variables like risk and trust are considered. These parameters affecting workers to wear the gadget are validated and predicted using adaptive Neuro-Fuzzy inference modeling and partial least square path.

The flux, vibration, heartbeat, and tilt sensors used in the Smart Solution for Women Safety [10] are used for safety. Location is determined using GPS, and the information is sent to the local police station and the woman's relatives, who tend to monitor her health indicators.

3. Technology Comparison

Since most of the devices are developed using Raspberry pi and Arduino, let us compare them in terms of technology.

Rasberrry pi	Arduino
1. Control unit is derived from ARM family.	1. Arduino-controlled unit is derived from
2. Rasberrry pi is typically based on a Microprocessor.	2. Arduino is typically based on Microcontroller
3. Produces output after computing data and Based on the computation outputs, it controls the Components in a system.	3. Particularly designed to control electrical components connected in a system.
4. Involves complex hardware and software Structures.	4. Involves simple hardware and complex
5. Expensive	5. Cheaper
6. Consumes a larger battery	6. Consumes less power than
7. Requires heavy RAM.	7. Requires less memory.
8. Greater clock speed	8. Slower compared to Rasberrry PI
9. Android installation is possible with Rasberrry PI which comes with functional operating System.	9. Arduino won't have functional operating
10. Works well in delivering software Application Applications.	10. Works well in interfacing with sensors and LEDS
11. Can perform multiple tasks at a time	11. Able to perform single task at a

Table 1: Analysis of Existing Work

4. Proposed System

The Proposed system consist of one Buzzer, which will make sound when women is in danger, One 16*2 LCD screen to display alert is sent or call is going on while women is in ganger, GPS antenna is used to fetch current exact location in form of Latitude & Longitude, to send receive sms and call SIM 800L GSM module is used. A small-scale GSM modem that can be included into numerous Internet of Things (IoT) projects is the SIM800L GSM/GPRS module. Almost all tasks that a typical cell phone can perform, including as making phone calls, sending SMS messages, connecting to the Internet via GPRS, and much more, may be carried out with this module. Led green light to show women is safe and when she is in danger a red led will glow. Raspberry Pi Pico is a tiny, fast, and versatile board built using RP2040, the flagship microcontroller chip designed by Raspberry Pi in the UK.

Specification of Raspberry Pi Pico are RP2040 microcontroller chip designed by Raspberry Pi in the UK, Dual-core Arm Cortex-M0+ processor, flexible clock running up to 133 MHz, 264kB on-chip SRAM, 2MB on-board QSPI flash, 2.4GHz 802.11n wireless LAN (Raspberry Pi Pico W and WH only), 26 multifunction GPIO pins, including 3 analogue inputs, 2 × UART, 2 × SPI controllers, 2 × I2C controllers, 16 × PWM channels, 1 × USB 1.1 controller and PHY, with host and device support, 8 × Programmable I/O (PIO) state machines for custom peripheral support, Supported input power 1.8–5.5V DC, Operating temperature -20°C to +85°C (Raspberry Pi Pico and Pico H); -20°C to +70°C (Raspberry Pi Pico W and Pico WH), Castellated module allows soldering direct to carrier boards (Raspberry Pi Pico and Pico W only), Drag-and-drop programming using mass storage over USB, Low-power sleep and dormant modes, Accurate on-chip clock, Temperature sensor, Accelerated integer and floating-point libraries on-chip.

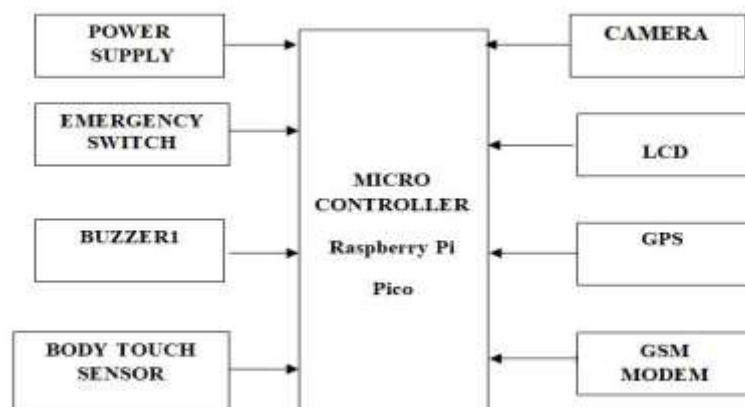


Figure 1: Design of Proposed system with components



Figure 2: Raspberry Pi Pico



Figure 3: SIM 800L

5. Implementation

At first we need to power on Device by powering on by battery, then each module will initialize itself and check the configuration and working of each and every module as shown in figure below.

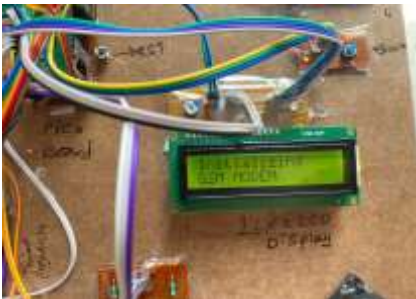


Figure 4: Initialization of Modem



Figure 5: Checking Device & GPS

Once configuration & initialization is done, Device is ready to use. It continuously reads the location using GPS module and as well as mobile network location, If anyone touches women for more than 5 second the body touch sensor gets activated and starts sending sms alert and call to registered number, at same time ESP 32- CAM captures the image of offender and send it to telegram. If women feels that it's not a bad touch she can use Reset button to abort the sms and call alert. During any type of sexual assault if body sensor gets damaged then also a switch is implemented which can also be used to send alerts and telegram photos. Moreover, the latitude and longitude data which is received by the GPS is delivered to both the LCD and the GSM modem which will forward the message to the woman's family/friends. Thus, even if she is knocked down from behind and is not able to trigger an alert, the Device will automatically send an emergency message to all the contacts listed by the woman as ICE contacts (In Case of Emergency contact) regarding the current location of the woman.

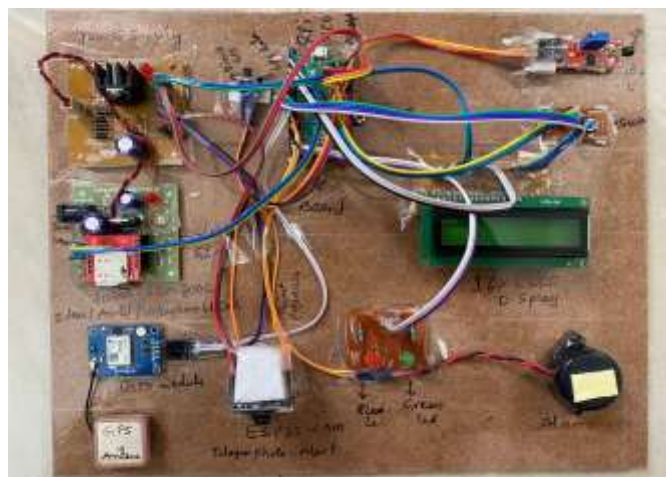


Figure 6: Implemented Device for Women Safety & Security System

As shows in figure above, the hardware is design implement finally for women safety & security, Whenever women is in danger red led will glow and alert will be send to family and friends, when there is no danger this Device will glow green light and will display that women is safe which will also display on LCD. Flow chart has been shown below how Device will work

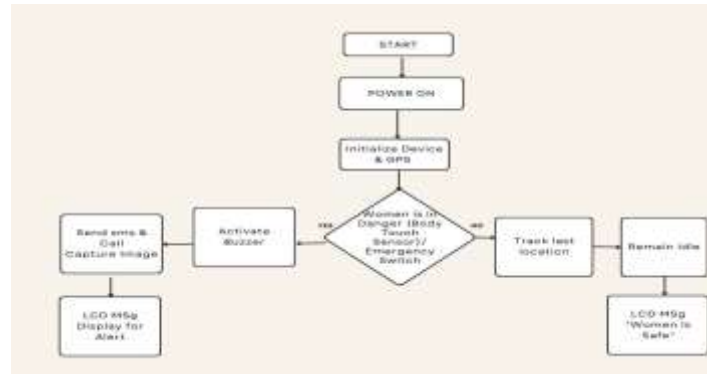


Figure 7: Implementation & working of Device

RESULT

This section presents the results of the experiments conducted with the proposed hardware design. Initially, the GSM module is verified whether it is properly connected and configured. After configuring GSM module, Device prompts the user. Once we power on Device it shows the device name "Design & and Implementation of women security system using IoT.



Figure 8: Device name on powering ON.



Figure 9: Sending sms when women is in danger.

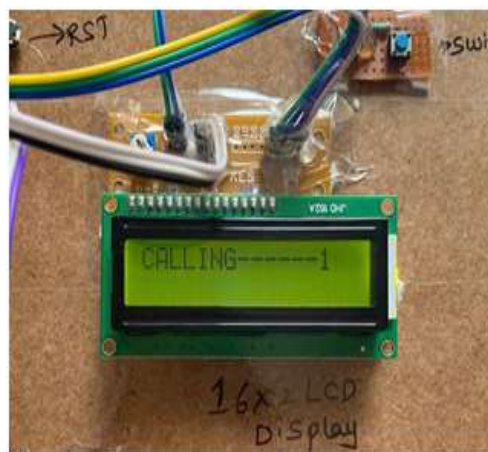


Figure 10: Calling on Emergency Contact Number.

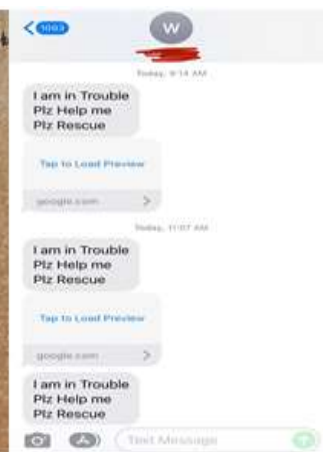


Figure 11: Sent Received on Victim's number

Conclusion

The proposed women's safety equipment intends to give ladies total security in contemporary situations. A buzzer is incorporated within the design to provide full security, alerting any registered users to the incident. Text messaging

makes sure that the victim's immediate family and the police are informed of their current whereabouts. In addition to the hardware-based design, created system's additional safety capabilities include sending messages, making phone calls, and locating nearby safe locations on a map. A camera will also be used to take pictures of the environment and any intruders.

References

1. Sriranjini R, "GPS and GSM Based Self Defense System for Women Safety", Journal of Electrical & Electronic Systems, Vol. 6, Issue 2, 2017.
2. M. Pramod, Ch V. Uday Bhaskar & K. Shikha, "IOT wearable device for the safety and security of women and girl Child", International Journal of Mechanical Engineering and Technology, Vol. 9, Issue 1 January 2018, pp. 83-88.
3. Muskan, Teena Khandelwal, Manisha Khandelwal & Purnendu Shekhar Pandey, "Women Safety Device Designed using IOT and Machine Learning", IEEE conference on Smart World, Ubiquitous Intelligence & Computing, Advanced & Trusted Computing, Scalable Computing & Communications, Cloud & Big Data Computing, Internet of People and Smart City Innovations, 2018, pp. 1204-1210.
4. Shubham Magidwar, Akshay Hargane, Pratik Singh, Mrudula Nade & Rama Gaikwad, "Implementation of a Wearable Defense System for Women's Security using Wireless Sensor Network", International Research Journal of Engineering and Technology (IRJET), Vol.3, Issue 11, Nov 2016, pp. 1217-1221.
5. Shaik Mazhar Hussain, "Women Security System", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Vol.3, Issue 3, March 2014, pp. 966-968.
6. A.H.Ansari, Balsaraf, Pratiksha P, Maghade Tejal R & Yelmame Snehal M, "Women Security System using GSM & GPS", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 6, Issue 3, March 2017, pp. 3706-3711.
7. G C Harikiran Karthik, Menasinkai & Suhas Shirol, "Smart Security Solution for Women based on Internet Of Things (IOT)", International Conference on Electrical, Electronics, & Optimization Techniques (ICEEOT),2016, pp.3551-3554.
8. Shruthi Prabhakar, "Techniques for Women Safety Based on Internet Of Things (IOT)", Global Journal for Research Analysis, Vol. 7, Issue 2, February 2018, pp. 624-626.
9. Huseyin Yildirim & Amr M.T. Ali-Eldin, "A model for predicting user intention to use wearable IoT devices at the Workplace", Journal of King Saud University – Computer and Information Sciences, 2018.
10. A.Jesudoss, Y. Nikhila & T. Sahithi, "Reddy Smart Solution for Women Safety using IOT", International Journal of Pure and Applied Mathematics, vol. 119, Issue 12, 2018, pp. 43-49.